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The Mining Journal

London, July 17, 1959

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DISPUTE IN THE PRINTING INDUSTRY

The dispute in the printing industry, the duration of which at present cannot be foreseen, is severely hampering the production of all British newspapers and periodicals, other than national daily and Sunday newspapers. In consequence, the size of *The Mining Journal* must, unfortunately, be substantially reduced until conditions are back to normal.

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Copper's Long-Term Prospects

AT A TIME when copper production is once more tending to out-run supply and prices have sharply declined, the British Non-Ferrous Metals Federation's forecast of consumption in 1963 is a welcome reminder that the long-term outlook for the industry remains extremely reassuring.

The Federation estimates that U.K. consumption of copper and copper alloy semi-manufactures in 1963 will be in the region of 600,000 l.tons gross weight, as compared with a consumption of 531,700 tons. Copper content of the estimated 1963 consumption is 505,000 tons against a content of 452,000 tons last year. The Federation also states that, in general, the principal copper and copper alloy fabricating industries of Western Europe anticipate an annual increase in consumption of semis of some two to four per cent.

These estimates are conditional, of course, upon relatively stable economic conditions in Western Europe, and also on the maintenance of copper prices at levels sufficiently low and stable to prevent further substitution by competitive materials such as aluminium, stainless steel, and plastics.

No less encouraging are the figures given recently by Mr. John R. Bradfield, president of Noranda Mines Ltd., in an address delivered to the National Federation of Financial Analysts' Societies in Montreal. Mr. Bradfield points out that Free World copper consumption has increased by 1,000,000 s.tons in the past ten years to the current level of approximately 3,500,000 tons. An annual increase of 4 per cent for Europe — about the same rate as in the previous ten years — together with a 2 per cent per annum increase in the U.S., should bring consumption to about 4,000,000 s.tons by the end of 1962. The expansion of existing mines and development of new mining projects, undertaken at great cost in recent years, can take care of this increased demand.

An interesting point made in the address is that, in terms of absolute tonnage (though not percentage-wise), world copper usage has increased more than aluminium usage since 1953. Copper consumption has risen by 738,000 s.tons annually, aluminium consumption by 635,000 tons.

In common with other leading producers, Mr. Bradfield considers that, apart from the short-term speculative variations, copper is entering upon a period of relative price stability which it has not enjoyed for many years, and at current price levels its competitive position should be strong.

Also worth noting, when considering the future copper picture, is that, according to a study made jointly by the Geological Survey and the Bureau of Mines, reserves of copper in the U.S. at the present time are estimated at 32,500,000 s.tons — enough to last 30 years at the present production rate of 1,100,000 tons annually. According to the estimate, between two-thirds and three-fourths of the nation's copper is in ores averaging slightly less than 1 per cent metal, and most of the remainder in ores averaging about 1.3 per cent.

An outstanding feature of U.S. reserve forecasts over the past three decades has been the upward trend in the quantity of

copper available in spite of the large tonnage of ore mined. The reserves have been increased largely by lowering the cutoff grade as a result of improved techniques in mining, milling and metallurgy. The average grade of copper ore mined in the U.S. 50 years ago was 2.5 per cent, in contrast to the present grade of slightly under 1 per cent, which is lower than that of any other major copper-producing country.

In the light of these figures it is evident that, although through exceptional circumstances the U.S. became a net exporter of copper in the second half of 1958, she will become increasingly dependent on overseas sources as time goes on. In fact, Mr. Henry J. Kearns, U.S. Assistant Secretary of Commerce for International Affairs, forecasts that by 1970 the U.S. will need 2,700,000 tons of copper annually.

Looking several decades ahead, Mr. Bradfield suggests that, taking into account the growth in world population and the quest for higher living standards, demand for base metals in the year 2000 could be about three times the average level for 1950-58. Since many of the present major deposits will be worked out during the next 40 years, all but a small percentage of this vastly increased demand would have to be supplied from ore deposits as yet uncovered.

It is logical, therefore, to anticipate that the position of companies with large ore reserves, capable of producing base metals at low cost, will become increasingly favourable in the years ahead. At the same time there are marked growth possibilities for companies well organised to seek and develop new deposits.

Meanwhile, so far as the immediate future is concerned, only a copper strike in the U.S. seems likely to spark off any significant recovery in the copper market, until the usual Autumn revival takes place. The general improvement in the economic outlook augurs well for a further growth in demand, which should eventually bring the supply position once more into balance. This process could, of course, be accelerated, if need be, by the voluntary curtailments of output which proved so effective in 1957-58.

It is disappointing that, within such a short period, output should again have outrun demand, but the fact that producers have the remedy in their own hands and have already shown themselves capable of applying it, is in itself a bull point for copper. Phelps Dodge has already set the ball rolling by a 7 per cent cut from the rate of output over the first half of 1959, with immediate effect. From the upward reaction in copper prices which immediately followed this news, it is evident that the market expects this example to be followed by other major producers. The correctness of this view has already been indicated by a 10 per cent cut announced by R.S.T.

FUTURE DIFFICULTIES FOR AUSTRALIAN MINING

Recent developments in Australia point to future difficulties for mining and industry generally. With highly competitive markets for metals, which call for strict cost control, the increase of 15s. per week in the basic wage, just granted by the Federal Arbitration Court is sufficiently serious, but the policy of the New South Wales Government in giving a 37½-hour week to employees in State-owned coal mines will have far-reaching effects, accentuated by the rise in the Federal basic wage Award. Primarily 1,200 men will be affected, but the way is now open for all industrial unions to approach the Arbitration Courts for variations in their Awards to make 37½ hours the standard working week.

The New South Wales black coal industry has, after many years, reached a stage of modest prosperity, and the long-dead

export trade is being built up. This has been possible only by increased output per man-shift, resulting from drastic re-organisation and mechanisation which have reduced costs to a level at which successful competition with other producing countries for overseas markets became feasible. The argument upon which the reduced hours is based is that the miners should share in the resultant prosperity—which at present is very limited—and should not be penalised.

It is estimated that in the State-owned mines, costs will rise by £A267,000 per year. If applications to the Federal Arbitration Court should succeed, output will be reduced, costs will rise, and the ground that has been won in coal export and in competition with oil will be endangered. Spread to the gold mining industry both basic wage increase plus a reduction in hours will be particularly serious.

AIRBORNE SURVEY IN THE U.K.

Canadian technicians will explore more than 22,000 miles of the United Kingdom this summer. A contract for an airborne magnetometer survey of areas in Ireland, Northern England, Southern Scotland, and the Irish Sea has been awarded to Canadian Aero Service Ltd., Ottawa, a world-wide air survey company.

The work is being supervised by the Geological Survey and Museum, a research establishment of the Department of Scientific and Industrial Research, and will cover 7,000 square miles in Ireland, 10,000 square miles in Northern England and Southern Scotland, plus some 3,000 square miles of adjacent areas of the Irish Sea. The land area has been mapped geologically, and certain parts have been surveyed by gravity meter, ground magnetometer, and seismic methods. The air survey data will be compared and correlated with these ground data.

Flying was to begin in mid-June. The Gulf high sensitivity magnetometer will be the survey instrument, and Decca navigation will help to guide the aircraft. Flight altitude will be 1,000 ft.

This is the fourth time Canadian Aero Service Ltd. has been engaged by the Geological Survey and Museum for these exacting, special surveys. This year's work will bring the total mapping done for them in the United Kingdom to more than 40,000 square miles.

THE MOHO LAYER

For many years geologists and others have discussed the feasibility of drilling down to the Moho Layer, the supposed boundary between the earth's "crust" and the ultra-basic layer. The American National Science Foundation has announced that funds are to be made available for an intensive study of the problem of putting down such a bore-hole. The probable site will be on the ocean bed 200 miles north of Puerto Rico, thus saving several thousand feet of rock drilling.

Since submarine drilling is currently confined to comparatively shallow off-shore deposits, the first need is to examine the design practicability of deep-water drilling equipment. In the suggested area it is estimated that the total length of drill hole required to reach the Moho Layer will be of the order of 12,000-16,000 ft., including some 1,500 ft. of ocean bed sediment. This is considerably less in depth than the maximum land boreholes put down for oil exploration although such holes have not the added complication of carrying out the process in deep water.

Almost certainly turbo drills will be employed for this probe into the earth.

The United States and World Resources of High Temperature Metals

ONE of the most difficult problems associated with engineering for jet engines, rockets, nuclear reactors, and similar developments, is the finding of suitable construction materials to withstand the very high temperatures generated by such devices. As more and more of these high-temperature metals are required, world supplies of the ores from which they are obtained will become correspondingly important.

To meet load-carrying requirements at high temperatures it is necessary to use ductile, oxidation-resistant metals, which will withstand temperatures up to 2,500 deg. F., and even higher. Where stresses are low, however, such established alloys as Nichrome V (80 per cent nickel, 20 per cent chromium) and Kanthal D (69 per cent iron, 28 per cent chromium, 3 per cent aluminium), which are oxidation-resistant up to 2,200 deg. F., are satisfactory.

Principal among the metals currently considered suitable for load-bearing, high-temperature service, either alone or as alloys, are columbium (melting point, 4,379 deg. F.), molybdenum (melting point, 4,752 deg. F.), tantalum (melting point, 5,425 deg. F.), and tungsten (melting point, 6,170 deg. F.). Because all these metals react rapidly with atmospheric gases at temperatures much over 1,000 deg. F., either oxidation-resistant alloys must be developed from them, or they must be given coatings to protect them. Chromium (melting point about 3,398 deg. F.), though not itself a high-temperature metal, is critical to the formation of many high-temperature alloys since it imparts oxidation resistance.

Where weight has to be taken into consideration, the lower density columbium and molybdenum, and alloys based on them, are the most attractive. Columbium also has a low thermal neutron cross-section which makes it particularly suitable for nuclear-reactor use. Tantalum is easily worked, but has relatively low strength and low elastic properties; though it is potentially important in combating corrosion. Having high strength at elevated temperatures, good elastic properties, and a high temperature of re-crystallization, tungsten is regarded as the ultimate metal for exposure to high temperatures. Tungsten itself is not easily worked, but if ductile, oxidation-resistant, tungsten-base alloys can be developed, they will probably come top of the list for high-temperature uses.

Cobalt, nickel, beryllium, and zirconium are considered of secondary importance to the development of high-temperature alloys. Though rhenium has a melting point of 5,666 deg. F., its production is limited to that accompanying the separation of molybdenum and copper in some porphyry copper ores.

Columbium and Tantalum

Closely related in nature and with similar metallurgies, columbium and tantalum are derived from columbite-tantalite, pyrochlore, euxenite (a complex, rare earth-bearing mineral), and koppite. The chief source is columbite-tantalite, usually called columbite, in spite of the fact

that the companion metals are found in widely varying proportions. Pyrochlore is finely disseminated in its host rock, and for this reason columbium has so far only been economically separated from this type of ore in Norway, where a similar mineral koppite is mined and processed.

Because the amounts of columbium and tantalum derived from a given tonnage of ore are small, mining methods must be simple and relatively inexpensive, even though the price of the metal recovered remains high.

World production of columbium-tantalum concentrates increased rapidly, from about 2,500,000 lb. in 1950 to 11,500,000 lb. in 1955, dropping to about 9,000,000 lb. in 1956, at which point the United States Government ceased placing orders for stockpile. According to the U.S. Bureau of Mines, world production of columbium and tantalum concentrates in 1958 was 5,000,000 lb., compared with 6,910,000 lb. in 1957.

The African continent dominates production with about 80 per cent of the world's output of columbium and tantalum. The north-central Nigerian deposits of pyrochlore are estimated to amount to 130,000,000 tons and to contain 0.28 per cent (or 360,000 tons) of combined pentoxides of columbium-tantalum. Uganda deposits are estimated at 200,000,000 tons and to contain oxide of columbium averaging 0.3 per cent. There is also estimated to be at least 11,000,000 tons of low-grade ore in several major zones in Tanganyika. Reserves of columbite-tantalite in Nigerian placers are known to exceed 70,000 tons of Cb_2O_5 . In British East Africa, pyrochlore deposits are said to contain 30,000,000 tons of ore averaging 0.7 Cb_2O_5 (or 210,000 tons of pentoxide). Other deposits in Nyasaland, Mozambique, South West Africa, and Madagascar are being developed.

Norwegian reserves, located at Sove in Southern Norway, have been proved at between 2,000,000 and 3,000,000 tons of pyrochlore-bearing ore with an average of 0.2 to 0.5 per cent Cb_2O_5 . The final milled product contains 40 to 50 per cent Cb_2O_5 , and while most of this is exported, Norway is developing her own ferrocolumbium industry.

There are large reserves of koppite in Germany, but it cannot be treated economically.

Tantalum-rich columbite-tantalite ores are found in the Belgian Congo and Brazil, in which latter country the

This is the first part of an adaptation of an article published in the *Stanford Research Institute Journal*, No. 2, 1958, by Richard M. Foote, head of the Earth Sciences Department, Stanford Research Institute, Menlo Park, California. Dr. Foote's department emphasizes research on water resources, mineral deposits, mineral economics, and the geochemical processes involved in the formation of various minerals. Dr. Foote is an authority on the structural geology of the Rocky Mountains and Appalachian Mountains; the occurrence and behaviour of ground water especially of limestone rocks; and the occurrences and origin of ore deposits, especially iron and manganese oxides and sulphite minerals.

world's largest deposit of high-grade pyrochlore-bearing rock has been outlined. It is estimated to contain 80,000,000 tons of ore with 6 to 14 pyrochlore content.

Reserves in Ontario, Canada, are estimated at 5,000,000 tons of 0.70 Cb_2O_5 , while, in Quebec, four similar sized reserves are thought to contain a total of more than 105,000,000 tons, one of them with a grade of 0.3 to 0.6 Cb_2O_5 . There are also deposits in British Columbia. Though Canada's potential resources are large, they are at present uneconomic to develop. No columbium-tantalum metal is yet produced in Canada, but it is believed that a satisfactory extraction and reduction process will be worked out. Research work is being carried out both by Battelle Memorial Institute and Cominco on behalf of Beauage mines. Other companies are also busy on this problem with the help of the Department of Mines.

Small amounts of high-grade tantalite ore (60 to 65 per cent Ta_2O_5) are found in Western Australia. Little information is available about deposits in the U.S.S.R. and satellite countries.

Production of columbium and tantalum in the United States never exceeded 1 per cent of the world total until 1956, the U.S. absorbing most of the world output till then, being dependent to 95 per cent on foreign sources of supply. Operations in the Bear Valley, Idaho, boosted production to 216,000 lb. in 1956. Despite a decrease of world production of 15 per cent in 1957, United States domestic deliveries of concentrate increased by 71 per cent in that year. They also slightly increased in 1958 to about 400,000 lb. Minor amounts, besides the output from Bear Valley, Idaho, were produced as by-products of pegmatites or placer mining operations in South Dakota, Colorado, New Hampshire, Arizona, Maine, New Mexico, and Connecticut. Other potential resources include pyrochlore-bearing carbonatite in Colorado and possibly other western states, and large quantities of columbium-bearing ilmenite, rutile, and red mud residues from industrial alumina processes in Arkansas. Recovery of columbium from the Arkansas materials has been investigated by the U.S. Bureau of Mines, but separation is at present regarded as uneconomic. None of the recent United States developments have involved tantalum-rich ores. Several new metallurgical plants were under construction in the United States in 1958.

United States production of columbium metal is estimated to have tripled in 1958 and tantalum metal to have increased moderately. Currently, these two metals are chiefly used in the form of ferro-columbium and ferrotantalum-columbium in the manufacture of stainless steel, but consumption for this purpose has recently been curtailed as a result of the recession. Columbium-treated steels, now being produced by the Great Lakes Steel Corporation, are said to give superior qualities of strength and toughness and weldability, yield strength of up to 60,000 lb. p.s.i. being claimed.

The U.S. Bureau of Mines research programme for 1959 includes improved solvent-extraction methods; fractional distillation of the chlorides; metallic reduction of the halides in a Kroll-type reactor; closed bomb reduction and other reducing methods; arc milling and electron-beam melting to produce super-refined grades for nuclear reactor applications. Physical metallurgy studies of the metals, compounds, and alloys produced, as well as a detailed study of fluoro-complexes will be undertaken. E. I. Dupont, Westinghouse, and Union Carbide also have extensive metal application research programmes in hand.

In Britain, a new plant for the production of pure niobium (an alloy addition, in the form of ferro-columbium, for stainless steels) and tantalum powders is expected to be placed in production in 1959 by Murex Ltd., of Rainham, Essex.

Tantalum is especially suitable for use in acid plants, in

the manufacture of laboratory equipment, surgical supplies, vacuum tubes, and other electronic equipment.

Dr. Foose estimates that probably about 1,500,000 tons of columbium metal could be made available from known world resources if economic extraction metallurgical processes were perfected. Reserves of tantalum have also increased, but not so significantly as those of columbium, because tantalum does not occur in the pyrochlore ores. He expects that the demand for both metals will increase greatly in the future.

Chromium

As well as being used for high-temperature alloys, chromium is used in the making of refractory bricks for high-temperature furnaces. There are no effective substitutes for it in many of its chemical and metallurgical uses.

Chromium ores are classified as metallurgical, refractory, or chemical, on the basis of their chromic-oxide content, and the ratio of chrome to iron. Metallurgical ore usually has a minimum Cr_2O_3 content of 48 per cent and a chromium to iron ratio of 3:1. The best ore is lumpy. For refractory chrome ore, the minimum combined chromic oxide and alumina percentage is normally 60, the maximum allowable silicon is 5 per cent, and the ore is lumpy. Coming from the Transvaal, the only ore of chemical grade averages about 45 per cent Cr_2O_3 , silica is low, and the ore is friable.

Turkey supplied a little less than one-fifth of the world's chrome ore production of some 4,300,000 s.tons in 1956, and was the principal source of high-grade metallurgical chrome. Reserves in two major districts are conservatively estimated at between 6,000,000 and 7,000,000 tons of oxide. The Philippines supplied about the same quantity as Turkey, but mostly of refractory grade. Reserves at Masinloo are estimated at 10,000,000 tons, but reserves at Luzon and elsewhere are not well known.

Next to the Philippines in supplying refractory grade chrome is Cuba, with an estimated 3,000,000 tons of ore available in Camaguey and Oriente provinces, containing a little less than 800,000 tons of oxide of chromium.

Canadian chromite sources are limited to about 10,000,000 tons of sub-grade ore, while European resources are limited almost exclusively to the Balkan States.

In the United States, the only deposits of any size are in the Stillwater rock complex in the Beartooth Mountains, Montana, where chromite occurs in steeply dipping rocks in a belt 1 to 5 miles wide and 30 miles long. Reserves are about 3,000,000 tons of 1:1 chrome to iron ratio, poor-grade ores. Reserves of better grade ore are small.

New Caledonia has been an important supplier of high-grade metallurgical chrome, and reserve potential is large. Minor production and reserves are recorded in India, Japan, Pakistan, Iran, and Afghanistan.

The largest reserves of chrome ore in the world are in Africa, Southern Rhodesia and the Transvaal having large resources of chemical grade and some metallurgical and refractory grade. Three main chrome districts in Southern Africa supply over a quarter of the world production.

The U.S.S.R. and Albania produced about one-fifth of the world output in 1956, and reserves are probably large. Huge resources of chrome are locked up in laterites in several parts of the world, but recovery has so far been uneconomic.

Because known world reserves of metallurgical and refractory grade ores are small in relation to total world ore reserves, attention is expected to be given to the utilization of lower-grade ores, as well as to searching for further sources of higher-grade ores. The demand for chromium is likely to increase greatly.

MINING MISCELLANY

A consultant's report on the possibility of establishing an oil-from-coal industry in the Central African Federation is almost complete, stated Minister of Commerce and Industry, Mr. Frank Owen, in answer to a question in the Federal Assembly. Mr. Owen said that the investigation was being undertaken by private enterprise.

Agreement has been reached by Empire Development Co., and Consolidated Mining and Smelting Co. of Canada, whereby the latter company will investigate the Quatsino properties on Vancouver Island for copper. The agreement provides for royalties to Empire Development should production follow.

The Finnish company, Oy. Vuoksniska Ab., has announced that it will concentrate its efforts on its iron mine at Jussaro in the Gulf of Finland and will abandon the pilot mine at Nyhamn in the Aaland Islands.

It was recently announced that the Government of Burma was to introduce a new production drive to increase its income from mining. The Minister of Mines was reported as stating that the Government would provide facilities for mining leases, imports of machinery and employment of foreign technicians, and that it would encourage joint ventures in this field with foreign firms.

The Japan Aluminium Refineries Association has stated that Japanese aluminium producers will shortly send a delegation of four members to Indonesia to find out whether there would be any change in the bauxite supply position in Bintan Island, following the anticipated transfer of the management of a Dutch bauxite export firm to Indonesian Government control. Last year Japan imported 278,000 tons of bauxite from Bintan and she plans to buy more than 300,000 tons this year. Japan's aluminium production depends largely on imports of raw materials from this area, other sources being Malaya, Borneo and India.

The Export-Import Bank has announced the granting of three credits to Turkey totalling \$6,610,000. These credits are the first allocated to the Turkish Government under the \$37,500,000 line of credit approved by the Export-Import Bank in September, 1958. The proceeds will be used to buy U.S. equipment and services. One credit totalling \$4,000,000 is to be used to expand lumber output. The second credit of \$1,000,000 will be used to increase bituminous coal production in the Zonguldak Basin, while the third credit of \$1,610,000 will be used to expand copper output at the Ergani mines.

On page 233 of *The Mining Journal Annual Review* for 1959, it is stated that two U.S. firms, Twentieth Century Fuels Inc. and Mid-East Oil and Mining Co., were negotiating with the Etibank regarding the development of chromite and man-



The stand of The Mining Journal Ltd at the C.U.M.M. Exhibition, Olympia

ganese deposits in Turkey, and that a co-partnership was to be formed with the Etibank for this purpose. We are asked by the Etibank to state that it has had no contracts and no connection whatever with the firms in question.

The Institution of Mining Engineers held its annual dinner on Thursday of this week at Grosvenor House, London. The toast of "The Mining Engineering Profession" was proposed by Lord Mills, Minister of Power, and was acknowledged by the President of the Institution, Mr. T. A. Rogers, C.B.E. This year's gathering was given a notable international flavour through the presence of a number of distinguished mining engineers who are attending the Institution's three-day symposium on shaft sinking and tunnelling which ends today at Olympia.

PERSONAL

We regret to announce the sudden death of Mr. A. F. Radcliffe. Mr. Radcliffe, lately editor of *Mine and Quarry Engineering*, had recently completed the term of office as president of the R.S.M. Association.

The board of Mason and Barry Ltd. has appointed Major Peter N. Cross Brown a director and it was decided that he and Dr. Leslie Hoff be appointed joint managing directors.

Mr. Robert Langford, of Humphreys and Glasgow Ltd., is to visit India to discuss with Indian Government officials the introduction of methods developed in Britain for making gas from coal under-

ground. He was to leave for India on July 15 and expects to remain until early August. Mr. Langford is in charge of Britain's underground gasification project at Newman Spinney, near Chesterfield, where Humphreys and Glasgow have been building a pilot plant on behalf of the N.C.B. A new method now in operation at Newman Spinney is showing such encouraging results that the Board has postponed closing down the pilot plant for a further month to enable more operating experience to be gained. It is thought that the process may have a valuable future in India's coalfields.

Mr. J. H. Rich and Mr. G. W. Simms have resigned from the board of Puket Tin Dredging Ltd.

COMING EVENTS

General meetings of the Institution of Mining and Metallurgy in the Session 1959-60 will be held at the Geological Society of London, Burlington House, Piccadilly, London, W.1, at 5 p.m. on the following dates: October 15, 1959; November 19; December 17; January 21, 1960; February 18; March 17; April 21; May 19 (A.G.M. from 4 p.m.).

The 21st Session of the International Geological Congress will be held at "Norden" from August 15-25, 1960. All communications should be addressed to the General Secretary, XXI Session, International Geological Congress, Mineralogisk Museum, Øster Voldgade 7, Copenhagen K, Denmark. The latest date for receipt of completed forms of application and membership is September 1, 1959.

Machinery and Equipment

New Instrument Detects Beryl

The following extract from *The Northern Miner* (Canada), is of interest to the mining industry, as the search for beryllium deposits, which will enable the ever-growing demand for this element to be met, is increasing rapidly.

Professor G. M. Brownell, department of geology, University of Manitoba, has remarked in a paper presented to the Canadian Institute of Mining and Metallurgy that the problem of finding new and more adequate sources of these elements is a challenge to the economic geologist. One such problem is the discovery of more abundant reserves of beryllium. Present inadequate supplies of beryllium are obtained largely from the mineral beryl. Commonly found in pegmatitic dykes.

Apart from the difficulties of recognizing many beryllium minerals at sight, chemical assays for this element are difficult and expensive and very frequently erratic in their results. These factors have con-

tributed to maintaining beryllium as a relatively costly metal but despite the cost the recent nuclear power and missile developments have created a demand for the element. A special effort is now required in order to locate more adequate sources of supply, and Prof. Brownell believes a much greater attention should be paid to non-pegmatitic beryllium occurrences.

He reports the development of a new portable field instrument, the beryllometer. This promises, he says, to be of much assistance in the field for both exploration and examination of beryllium deposits. The beryllometer makes use of a well-known nuclear reaction to detect the presence of beryllium and to provide a rapid method of assaying. When beryllium in any chemical combination is bombarded by gamma rays having a certain minimum energy, photo neutrons are emitted. Antimony 124, an artificially produced radioisotope, is the source of gamma radiation employed. Beryllium is the only element

that can produce neutrons with this instrument.

The beryllometer is a scintillation counter incorporating a 5-inch photo multiplier tube and phosphor. The antimony 124 source is sealed in a metal capsule, fixed on the lower side for lead shield, that is attached to the base of the instrument. When the instrument is not in use, this shield is detached and placed in a lead container.

As a safety measure, the beryllometer is suspended from a pole about 8 feet long carried between two men during normal field use. By this means, the operators maintain a safe distance from the source, whose gamma radiation is directed downwards. The instrument can readily be set down on any rock outcrop, and the presence of beryllium detected immediately by means of earphones worn by the rear man who directs the work. For quantitative measurement or for assaying of samples, the earphones are replaced by a small portable counting register which automatically records the neutron count. The total weight of the instrument is 10 lbs. and with shield attached as carried in the field is about 25 lbs.

The antimony 124 has a half life of 60 days, but fortunately the instrument's neutron detection efficiency increases as the antimony 124 loses strength. In normal operation, a gamma source has a life of about four months in a field instrument.

Since beryllium is difficult to determine by sight it is believed that the most useful service the beryllometer can perform is to provide the prospector with something that can positively identify beryllium in any form. Also, in the re-examination of any known occurrence there may be revealed an extension beyond presently recognized boundaries.

MOBILE ELECTRIC CRANES

Two new mobile electric cranes, which can set their own outriggers and be ready to lift capacity loads within 30 seconds, have been announced by R. G. LeTourneau, Inc., United States. Known as the Series R-30 and the Series R-45 cranes, they have capacities of 30 and 45 tons respectively. All operating functions of both are electrically powered. Individually operated, electric-powered outriggers form a leveling-lifting platform on varied terrain, and are controlled from within the operator's cab, affording important savings in time and manpower.

Equally important, however, is the smooth exacting control of capacity loads. This is achieved through variable speed regulation of D.C. motors which power the hook line and boom swing. Added load-handling accuracy is provided by powered down-travel of the hook line, and positive 360-deg. power control of boom swing. There are no friction clutches to grab or slip, only smooth power application actuated through finger-tip operator controls. Thus loads are hoisted and positioned with minimum operator fatigue.

Maximum load-handling safety is provided by electro-magnetically released, spring-loaded disc brakes on the control motor for each powered function.



Metals and Minerals

Revival of Magnesium Demand

The upsurge in demand for magnesium and magnesium products in the U.S. has proved so much stronger than earlier anticipated, that the Business and Defence Services Administration has revised its estimates of consumption for 1959. In its mid-year *Review and Outlook*, B.D.S.A. states that the stronger outlook for the general economy, together with favourable developments in the magnesium field, have combined to indicate that magnesium consumption this year can be expected to show an increase of 25-30 per cent over 1958, instead of the 20 per cent "or more" previously estimated.

Shipments of primary magnesium through the first four months of 1959 rose by 35 per cent over those for the corresponding period of last year, while overall industrial production increased by 13 per cent. Mill products shipments over the same period increased by 34 per cent. The most significant factor is that the impact of the up-trend is now being felt at the ingot level.

Though plant stocks are still comfortably adequate they are gradually being whittled down and, as a safeguard against any sudden increases in requirements, production is to be slowly built up. Output rose by 860 tons in May to 2,668 tons, and it is felt that this gain of 48 per cent from the April figure could be the beginning of a trend.

In addition to increased usage in commercial products, more magnesium is likely to be used both in the production of titanium metal and in aluminium alloying, which is an important outlet. Now that demand for primary magnesium exceeds current output, it is expected that some of the currently idle facilities will be put back into production this year.

From Tokyo it is reported that, as a result of activity in such manufacturing fields as television receivers, appliances, etc., Japanese magnesium requirements and production will rise this year. The present estimate of 1959 requirements is about 4,400 s.tons against about 3,500 s.tons in 1958. A production goal of about 5,100 tons has been authorized, of which 1,750 tons will consist of primary metal.

In the U.K. the general level of demand for magnesium has so far shown little change, but the short-term outlook is regarded as distinctly encouraging.

ALUMINIUM AND BAUXITE

A new section of plant was officially inaugurated on June 27 at the A/S Ardal og Sunndal works, the State-owned concern which is Norway's biggest aluminium producer. The new section, known as Ardal II, has an annual output capacity of over 36,000 tonnes, bringing Ardal's total capacity to about 65,000 tonnes annually. The plant at Sunndal has a capacity of about 50,000 tonnes a year. A third stage of expansion at Ardal is already well under way and is scheduled to start operation in 1961. Ardal III will have an annual output capacity of over 32,000 tonnes, bringing total production of the Ardal plant to nearly 100,000 tonnes.

Norway's aluminium output is now closely approaching France's last year's figure of 169,000 tonnes, and when Ardal III and the Mosjoen plant are completed,

her total production will be nearly 250,000 tonnes annually. Next year Mosjoen will be producing 33,000 tonnes—twice the output in 1958.

The completion in the next few months of a second £6,000,000 alumina plant for Alumina (Jamaica) Ltd. has been announced by the chairman and managing director, Dr. D. A. Bryn Davies. It is hoped that conditions in the world's aluminium industry and the company's business will justify bringing the new plant into initial operation towards the end of the current year. It will then be another two years before the full production capacity of about 250,000 tons of alumina annually is attained.

A tanker, claimed by its builders to be the first ever to be built entirely of aluminium, is on the stockyards of the Kieler Apparate- und Maschinenbau GmbH for the Reedereigemeinschaft shipping company of Frankfurt. It is claimed that, owing to its lighter weight, the aluminium ship will be able to carry larger loads than a similar vessel made of steel. Moreover, lengthy de-rusting and scraping processes would be eliminated.

A division of National Lead Co. has patented a die cast eight-cylinder aluminium engine block for motor cars. At present, no American car engines are made of aluminium, but the 1960 Corvair, which is to be General Motors' smallest car, will have an aluminium six-cylinder engine.

Alcoa has acquired an interest in a special bauxite mining lease in Jamaica. It will go into partnership with Caribex Ltd. (a subsidiary of American Metal Climax) in respect of a special mining lease held by Caribex. Alcoa has undertaken to carry out an intensive programme of further prospecting in the area, as well as evaluation of prospecting work already done and engineering and planning requirements for mining operations. This work is to be completed by May 31, 1960, by which time Alcoa will have spent at least \$200,000. If then decides to proceed with development this will entail a further expenditure of at least \$1,750,000 by May 31, 1963, when the company would be ready to start extraction.

Kaiser Aluminium and Chemical Corporation is reported to be holding exploratory talks with six aluminium producers from various countries with the aim of forming an international consortium to erect a reduction plant in Ghana with an annual capacity of 220,000 tons. The proposed facility would be a conventional potline operation adjacent to the Kosombo Dam near Accra, and would cost between \$100,000,000 and \$150,000,000. An initial operation of about 120,000 tons annually is proposed. Preliminary work has already begun on the Kosombo Dam, which is the first of three dams to be constructed as part of the Volta River project.

The identities of the producers partici-

pating in the present talks have not yet been revealed, but Aluminium Ltd. is reported to have shown definite interest in the project.

SOVIET CHROMITE FOR U.S.

A deal has been concluded, subject to the U.S. Department of Commerce granting the necessary export licences, whereby U.S. steel companies will purchase 350,000 tons of Soviet chrome ore over the next four years in exchange for steel at an annual rate of 30,000 tons. The U.S.S.R. has expressed a preference for aluminized steel sheets for motor car bodies.

LONDON METAL AND ORE PRICES

The following prices, as quoted on July 16, 1959, have changed during the past week :

Gold 249s. 10½d., silver 78½d. spot, 78d. forward, tellurium 14s. lb., titanium ore—rutile 95/97 per cent TiO_2 (prompt delivery) £31/£32 per ton c.i.f. Australian.

COPPER • TIN • LEAD • ZINC

The spotlight has once again been focused on the copper market which ended last week with a very uncertain undertone. At the beginning of this week, however, moves were made by the producers in America who reduced their price to 30 c. per lb. following a further reduction in the customs smelter price to 29 c. per lb. This downward movement was followed by the Belgian producer on Tuesday, when the price was reduced to the equivalent of 26.35 c. per lb., New York or Antwerp. This consolidation of prices enabled a sharp recovery to take place on the receipt of news from Phelps Dodge that they were reducing their output for the second half of 1959 by 7 per cent and, on the publication of the June statistics which showed that producers' stocks, both inside and outside the United States, had fallen by a total of 5,733 short tons, deliveries in both areas were appreciably higher. With the commencement of a steel strike in America, the possibilities of a strike in the copper industry are rated higher than before.

Tin has shown little change although a backwardation has developed. On Thursday the Eastern price was equivalent to £810 per ton c.i.f. Europe.

Lead has been featured by fairly heavy buying of current period metal which has tended to narrow the contango, whilst the zinc market has remained active with very little change in either level or backwardation.

Closing prices up to midday, July 16, are as follows :

	July 9 Buyers Sellers	July 16 Buyers Sellers
COPPER		
Cash	£214½	£215
Three months	£215½	£216
Settlement	£215	£227
Week's turnover	16,875 tons	17,075 tons
LEAD		
Current ½ month	£69	£69½
Three months	£70½	£70½
Settlement	£70½	£70½
Week's turnover	7,700 tons	6,700 tons
TIN		
Cash	£791	£792
Three months	£791½	£792
Settlement	£792	£793
Week's turnover	485 tons	1,030 tons
ZINC		
Current ½ month	£79½	£79½
Three months	£79½	£79½
Settlement	£79½	£79½
Week's turnover	7,250 tons	6,400 tons

Mining Finance

Changing Situation of South African Coal

The demand/supply relationship of coal in South Africa, as in so many other parts of the world, has undergone a quite rapid change during the last year or so. From a situation in which demand was substantially outstripping deliveries, the picture has altered until the mines are now having to look quite hard for outlets for their product.

The reasons for the swing are roughly similar to those applying elsewhere, the most important element being the slowing-up of economic progress touched off by the American recession, which hit South Africa rather late. The most striking feature of the Union's coal position, however, is the suddenness with which the situation has changed.

It was the truckage situation that was largely responsible for the speed of the reversal. Only eighteen months ago, the main problem facing the colliery owners was rail transport, and, indeed, many collieries were shipping large proportions of their output expensively and inconveniently by road. Even with this emergency assistance, the main limitation on output was transport, and several producers were poised to increase production as soon as the truck position improved. Unfortunately, when more trucks became available, it was the result not only of accelerated building, but also of decreased usage on the part of secondary industry, so that in a short space of time the coal mines found themselves with ample transport facilities, but a shortage of demand.

This was simultaneously aggravated by a surplus of labour. The demands of secondary industry fell to a rather lower level, and mine managements were reluctant not to employ larger complements on the grounds that labour once turned down would be harder to re-employ at a later date.

The obvious answer, bearing in mind the low pit-head cost of S.A. coal, would be the development of an export market. Unfortunately, the Union's distance from the "have-not" areas is so great that transport costs bring prices to much the same level as those for the major exporting countries. In addition, there is a certain backlog of "badwill" to be overcome, dating from the sudden cessation of export deliveries a few years ago.

One of the most important companies in this field is Henderson's Transvaal Estates (controlling the Tweefontein Colliery), but it would be quite wrong to identify it exclusively with coal. Indeed, its mineral holdings in the Bethal and other areas may turn out to be of equal, if not superior, importance from a profit-earning point of view. Henderson's are currently quoted at about 13s. 6d. to yield 6½ per cent. This is not generous, but should the Bethal interests prove profitable, Henderson's could respond sharply.

Scrip Issue From Mason and Barry.—Mason and Barry have decided to revalue their fixed assets at a provisional figure of £100,000. This will create a capital reserve of £53,328, of which £23,147 will be

capitalized and used as the basis of a one-for-eight scrip issue in due course. At the E.G.M. to be called to consider these proposals it will also be recommended that the company's issued capital be increased from £790,000 to £1,000,000 in order to "be prepared for possible future developments".

Consolidated Tin Smelters.—Consolidated net profit of Consolidated Tin Smelters for the year to March 31, 1959, totalled £396,301 after providing £446,452 for taxation. This compares with £531,219 (after £697,018) for 1957-8. The recommended distribution for the year is 3s. 6d., made up of a 3s. dividend and a 6d. bonus, as in the preceding year. Meeting, September 10.

Gold Fields Bid for Anglo-French.—Consolidated Gold Fields have now issued their formal offer for the share capital of Anglo-French Exploration. It is stated that Gold Fields expect to pay a final dividend for 1957-8 of not less than 3s. 6d., making a total of 4s. 9d., compared with 4s. 6d. for the previous year. Anglo-French shareholders who accept the offer will not rank for this dividend, however, receiving instead a dividend of 2s. which Anglo-French will declare after the offer becomes

unconditional. The offer, as previously stated, is of one Gold Fields share and 5s. in cash for every £2 stock of Anglo-French. The value of the offer at middle prices on June 18 was 39s. 7½d. per Anglo-French stock unit.

Indian Copper Earnings Down.—Net profit after tax and depreciation of the Indian Copper Corporation for 1958 was £197,785 against £252,215. The unchanged dividend of 18 per cent absorbs £246,834, leaving a balance of £71,312 carried forward against £120,361 brought in. Meeting, Calcutta, September 23.

Anglo-Burma Tin.—At the annual meeting of Anglo-Burma Tin last week, Mr. F. R. Cottell, the chairman, revealed that the Burma Government is considering proposals for the further financing of the joint venture company. It is proposed that Anglo-Burma should sell half its interest in the joint venture company to the Government. The Burma Government would then lend, or procure on loan from another Burmese source, an amount equal to 75 per cent of the cash required by the joint venture company, and Anglo-Burma would provide the remaining 25 per cent from the proceeds of the share sale.

IDRIS HYDRAULIC TIN LIMITED

MR. A. G. GLENISTER'S REVIEW

The forty-fifth annual general meeting of Idris Hydraulic Tin Limited, was held on July 8, at 73 Cheapside, London E.C.2.

Mr. A. G. Glenister, C.B.E., Chairman, presided. The following is an extract from his circulated Statement:—

The profit for the year 1958 was £10,161 which, added to the balance of £19,823 from the previous year, makes a total credit of £29,984. A dividend of 1d. per share has been paid and the Directors recommend payment of a final dividend of 2d. per share, together with a bonus of 3d. per share, leaving £22,709 to be carried forward.

A further special cash distribution of 6d. per share on account of the capital profit arising from the sale of the Kranji Section was made on July 10, 1958.

The Tin Control and Buffer Stock Regulations continue to have a particularly adverse effect upon the Company, and, in order to keep production, including production for stock, within the permitted limits, it was necessary to suspend mining operations for no less than 125 days during 1958.

The total permissible exportable tonnage of the producer countries signatory to the International Tin Agreement is to be raised for the third quarter of this year to 25,000 tons. Although this will be very welcome, particularly as it indicates a growing confidence in the general tin position, the actual increase in benefit to Malayan producers will be small.

The Company's own assessment under

the Tin Control Regulations was raised in April, 1958, from 1,179 piculs to 2,000 piculs of ore per annum and, following an appeal to the Minister of Natural Resources, to 3,000 piculs per annum as from April, 1959. The arrangement by which the purchasers of the Kranji Section made available 2,040 piculs of assessment to the company under the grouping system, came to an end on December 31, 1958.

Unless the total permissible exportable tonnage is again raised, little or no profit can be made by the Company on its current assessment, which is still well below its proved capacity, but the Company's continued high rate of production while operating will entitle it to a further considerable increase in assessment when the general revision of assessments comes into force in July, 1960. From then on the Company's prospects will be greatly improved although, of course, actual profits will depend upon the then price levels of tin and the degree of restriction of sales which is then in force.

During the year under review the placing of Russian tin on the market in quantities not foreseen by the International Tin Council completely upset its estimates of supply in relation to probable demand and this subjected the operation of the International Tin Agreement to very severe strains.

On September 18, 1958, the Buffer Stock Manager who, under the provisions of the Agreement had been endeavouring to maintain the floor price, was forced to (Continued on page 66)

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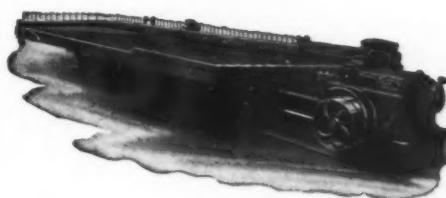
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withdraw from the market on the London Metal Exchange, and there was an immediate, but temporary, suspension of dealings. In the afternoon of the same day, when dealings were resumed, the price at once fell by nearly £100 per ton, but quickly recovered and for some time now it has been above £780 per ton metal, which is the price level at which the Buffer Stock Manager is permitted to sell.

Operation of Buffer Stock

It has been announced that the stocks of tin acquired by the operation of a Special Fund, which was authorised by the International Tin Council early in 1958 to help protect the floor price, have now been sold and it may be safely assumed that the Buffer Stock Manager has been able to dispose of an appreciable amount of the stocks held by him under the provisions of the Agreement. Demand is also increasing and the general position is improving. It must be realised, however, that, although Russia has informed the International Tin Council that she intends to limit her tin exports to non-communist countries to 13,500 tons during the present year (which is some 4,500 tons less than the amount placed on the market in 1958), experience has shown that the position must always remain uncertain and potentially dangerous unless the full adherence of all large tin-producing countries (including Russia and China) to the provisions of the International Tin Agreement can be obtained. It has also become apparent that the Buffer Stock Manager should be given greater latitude in his market operations.

The present Agreement expires on June 30, 1961, and a decision as to whether it should be renewed must be made by June 30, 1960.

HENDERSON'S TRANSVAAL ESTATES LIMITED

Very Satisfactory Results

The 47th annual general meeting of Henderson's Transvaal Estates, Limited was held on July 8 in London.

Sir Joseph Ball, K.B.E. (the chairman), presided and, in the course of his speech, said :

The net profit attributable to the parent Company, after all charges including taxation, at £89,000, is rather more than double the figure for last year, viz. £43,700. In the light of these very satisfactory results, your Board feels justified in recommending a final dividend of 15 per cent which will make a total distribution for the year of 21½ per cent. It is probably unnecessary for me to point out that the recommended rate of dividend is an all-time high in the history of the Company.

Commenting on the Company's dividend record, the Chairman said : Stockholders have been well rewarded in the past, and I have no hesitation in expressing the view that they may look forward with some confidence to the future prospects of the Company.

Turning for a moment to the Company's investment portfolio, I may here remark that, since the end of the financial year, there has been an increase in the value of our quoted securities which, on July 3, showed the very substantial appreciation of £350,000 on the balance sheet value of £675,000—as compared with an appreciation of £216,000 on March 31 last.

The Chairman then reviewed the activities of Tweefontein United Collieries Limited, White's South African Portland Cement Co. Ltd., and Mineral Holdings Limited.

The report was adopted.

TANJONG TIN DREDGING, LTD.

Mr. A. G. Glenister, C.B.E., Chairman, presided at the thirty-third annual general meeting of Tanjong Tin Dredging, Ltd., held on July 9.

The net profit for 1958, after charging £47,400 taxation, was £78,355 to which must be added £22,796 brought forward from 1957 and £14,758 taxation provision no longer required. Dividends amounted to 2s. 9d. per share (less income tax) absorbing £60,163. £24,752 was written off Fixed Assets, etc. and £10,834 transferred to General Reserve, leaving a carry forward of £20,160. Buffer Stock contributions amounted to £72,854 and provisions for future tax thereon to £29,142.

Under the Malayan Tin Control Regulations, the sales of tin-ore were restricted to 488 tons as against the 1,055 tons sold during 1957, and the yardage treated was reduced to 2,837,500 cubic yards from the 4,091,300 cubic yards treated the previous year. The average recovery was 0.45 lb. per cubic yard and the working cost per cubic yard was 10.07 pence.

Dredge No. 1 remained on a care and maintenance basis throughout the year. The output was produced by Dredge No. 2 which had to be closed down from time to time to keep production within the permissible limit allowed under the Tin Control Regulations.

During 1958, permissible tin-ore sales varied between 50.8 per cent and 43.5 per cent of the Company's Assessment, of 1,042 tons. For the quarter July to September, the rate of quota is 51.56 per cent.

The burden borne by Malayan producers in maintaining restriction and contributing to the Buffer Stock remains a very heavy one and, during the current year, it will again be necessary to cease mining operations from time to time to keep your Company's production within the limits allowed.

The report and accounts were adopted and at a subsequent extraordinary general meeting resolutions were passed giving effect to the Board's capital proposals.

KINTA TIN MINES, LTD.

Mr. A. G. Glenister, C.B.E., Chairman, presided at the fifty-eighth annual general meeting of Kinta Tin Mines, Ltd., held on July 9.

The net profit for 1958, after charging £10,964 taxation, was £18,400 to which must be added £22,109 brought forward from 1957 and £34,011 taxation provision no longer required. Dividends amounted to 1s. 3d. per share (less income tax) absorbing £17,700. £11,856 was written off Property and Plant, etc., and £15,900 provided for future taxation on Buffer Stock Contributions of £39,748 leaving a carry forward of £29,064.

Under the Malayan Tin Control Regulations the sales of tin ore were restricted to only 195 tons against the 717 tons sold the previous year. For the same reason the yardage treated was reduced to 702,000 cubic yards from the 1,311,900 cubic yards treated in 1957. The average recovery was 0.88 lb. per cubic yard and the working cost per cubic yard rose to 26.50 pence against 19.40 pence in 1957.

These figures clearly illustrate the severity of the incidence of restriction on the Company and the disparity which exists

between the Assessment granted and the true productive capacity of the mine. I am glad to say that the Company's current high rate of production while operating will, under the Tin Control Regulations, entitle it to a substantial increase in Assessment when the general revision of assessments come into force in July, 1960. In the meantime, the Company's Assessment is only (470 tons) of which we continue to be allowed to produce only approximately half.

During 1958, the effective permissible tin-ore sales varied between 50.8 per cent and 43.5 per cent of the Company's Assessment. For the quarter July to September, the rate of quota is 51.56 per cent.

The burden borne by Malayan producers in maintaining restriction and contributing to the Buffer Stock remains a very heavy one and, during the current year, it will again be necessary to cease mining operations from time to time to keep the Company's production within the limits allowed.

French Tekkah. The purchase of this undertaking in Malaya is a most valuable acquisition, including as it does, three hydro-electric power stations producing a substantial supply of electrical energy at low cost, a 30-inch pipeline for pressure water supply to the mines, some reserves of mining land and additional areas for future dumping of tailings, and certain advantages regarding assessment under the Tin Control Regulations.

The report and accounts were adopted.

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SIAMESE TIN

DIFFICULT CONDITIONS

The 52nd annual general meeting of Siamese Tin Syndicate Ltd., was held on July 9 in London, Mr. W. R. B. Foster, chairman, presiding.

The following is an extract from his review of the year 1958:—

The year was not an easy one for tin mining companies and we, like others, suffered from restrictions on production and from prices which kept obstinately low for nine months of the period. Unfortunately therefore, the indication I gave in my review for 1957 of marginal profits in 1958 proved to be correct. Our press announcement on November 27, 1958 also drew attention to the small profits earned up to then.

Restraints on exports of tin ore applied throughout the whole year, production for stock as well as for export was permitted and transfers of "quotas" from one mine to another were allowed. The consequence was a very uneven year's working.

Accounts

In view of the conditions under which we operated, profits, regrettably though inevitably, were low, but fortunately we were able to write back £20,000 of tax provisions no longer required. The U.K. registered companies of the group are now benefiting from the provisions in the Finance Act 1957 exempting them from tax on their overseas income: on the other hand our single dredge Malayan subsidiary now pays away 40 per cent of its profits in direct taxation, in addition to a royalty of about £17,000 on a gross turnover of about £106,000.

Our cash resources have been depleted due to the combined effects of reconstructing two dredges and of contributing to the Buffer Stock.

We have a bank overdraft of £104,000 and bearing in mind first the necessity to explore for new properties if we are to continue as a mining company, second the need to keep in hand a reasonable sum for day to day working expenses, and third our slender profits, we shall probably be short of cash for the remainder of this year. It is for these reasons that we have decided to recommend a dividend for 1958 of 3d. per stock unit only and to omit the interim which it has been customary to declare about this time.

Outlook

In 1958 the International Tin Council weathered a potential "no-confidence" situation and prices have now moved away from the Floor Price of £730 per ton. In October the forward prices averaged £735 a ton and in December, £758 which indicated a better outlook for the metal.

The Tin Research Institute is very active in promoting new uses for the metal throughout the world as well as improving older techniques. In the United States new canning plants are being built and there is increasing confidence that the recession is a thing of the past. Our large scale reconstruction of dredges has been completed and we are able and very willing to put our plant to the test of further quota releases. The staff, both here and in the East is eager to help in making 1959 a better year than 1958. That could prove to be the case, but I must repeat what I said a year ago, namely that profits are bound to remain small as long as severe restriction of output lasts.

The report was adopted.

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